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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/663,675	09/17/2003	Bryan G. Cole	M4065.0907/P907	2447

45374 7590 11/29/2010
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EXAMINER	
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ART UNIT	PAPER NUMBER
2622	

MAIL DATE	DELIVERY MODE
11/29/2010	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/663,675	Applicant(s) COLE ET AL.	
	Examiner MICHAEL OSINSKI	Art Unit 2622	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 September 2010*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *11-16,18-21,23,25,28,30,31,58-67 and 72-75* is/are pending in the application.

4a) Of the above claim(s) *23,25 and 28* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *11-16,18-21,30,31,58-67 and 72-75* is/are rejected.

7)☒ Claim(s) *30,31,72 and 75* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *18 November 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This Office action is in response to communications filed on 9/29/2010. Claims 11-16, 18-21, 23, 25, 28, 30, 31, 58-67, and 72-75 are currently pending with claims 23, 25, and 28 withdrawn from further consideration.

Response to Arguments

2. The Applicant's arguments regarding the claims have been fully considered but are moot in view of new ground(s) of rejection using different interpretations of the previously cited references with respect to the pending claims necessitated by Applicant's amendments to the claims.

Claims

3. Claims 30-31 are objected to due to the following informalities: claims 30 and 31 currently state "the photodiode of each pixel is entirely laterally adjacent photodiodes of other pixels..." Appropriate correction is required.

4. Claim 31 is objected to due to the following informalities: claim 31 currently includes the limitation "the third photosensor;" however, there is insufficient antecedent basis for this claimed limitation. Appropriate correction is required.

5. Claim 72 is objected to due to the following informalities: claim 72 currently includes the limitation "the substrate;" however, there is insufficient antecedent basis for this claimed limitation. Appropriate correction is required.

6. Claim 75 is objected to due to the following informalities: there are two claims currently numbered "75." For sake of clarity, the second claim numbered "75" will be referred to as "76" below. Appropriate correction is required.

Claim Rejections – 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. ***Claims 11-12, 14-15, 18, 20-21, 30-31, 58-64, and 66-67 are rejected under 35 U.S.C 103 as being unpatentable over Merrill (US Patent 7,132,724) [hereafter Merrill] in view of Descure (US Patent 6,960,799) [hereafter Descure] and Merrill (US PGPub 2002/0058353) [hereafter Merrill 2].***

9. As to claim 11, Merrill discloses an image pixel array (Fig. 17) comprising rows and columns of color-filter detectors (Fig. 7) that each comprise a substrate comprising of p-type layers (62, 64, 74, and 86) and a silicon overlayer (62a), a first photosensor (green photosensor 78) disposed at or beneath the surface of

the substrate, a first filter (80 and 86) of various p-type layers over the first photosensor and in contact with the substrate (doping region 76 of substrate component 74 and isolation regions 88 of substrate component 86), the first filter having a first thickness from being a part of a 1 micron p-type layer (74) and including the thickness of a .25 micron p-type layer (86) and absorbing incident light with wavelengths shorter than those of green light and transmitting light at wavelengths greater or equal to green light onto the photosensor that receives the light passed through the first filter (as shown in Figure 7 where light rays with wavelengths characteristic of green and blue light pass through layers 86 and 80 to be absorbed at detector 78 while red light rays pass through detector 78), the first photosensor absorbing/holding the charges created by light having wavelengths equivalent to green light and passes on red light which has a longer wavelength, a second photosensor (red detector 68) at or beneath the surface of the substrate and laterally adjacent to the first photosensor (78) (as illustrated in Figure 7 being placed offset laterally to the first photosensor (78)) that has a second filter (70, 74, and 86) comprising of various p-type layers disposed over the second photosensor (68) and in contact with the substrate (doping region 66 of substrate component 64 and doping regions 76 of substrate component 74), the second filter being thicker than the first filter from being part of a thicker 2 micron p-type layer (64) and comprising of the 1 micron and .25 micron p-type layers (74 and 86) (Fig. 7), that absorbs light with wavelengths less than those of red light and allows red light to pass through to the second photosensor (red 68) that receives the light passed through the second filter and absorbs/holds the

charges created by light having wavelengths equivalent to red light and passes on light with wavelengths longer than those of red light (as shown in Figure 7 where light rays with wavelengths characteristics of red light pass through layers 70, 74, and 86 to be absorbed by detector 68), and a third photosensor (blue detector 90) at or beneath the surface of the substrate and laterally adjacent to the first and second photosensors (78 and 68) (as shown in Figure 7 being placed offset to the first and second photosensors) that absorbs incident light (blue light) at wavelengths shorter than the first wavelength and passing a majority of incident light at wavelengths longer than the first wavelength (green light) (as shown in Figure 7 as the blue light ray stops at detector 90 and the red and green light rays pass through the detector 90) wherein the p-type layers (80) over the first photosensor (78) and the p-type layers (70) over the second photosensor (68) are above the surface of the substrate (the first filter (80 and 86) is disposed on top of the surface of substrate portion 74 which is also above substrate portions 64 and 62, and the second filter (70, 74, and 86) is disposed on top of the surface of substrate portion 64 which is also above the substrate portion 62) (Col. 5, 37-46, 62-67, Col. 6, 4-66, Col. 14, 45-67, Col. 16, 34-42).

It is however noted that Merrill fails to particularly disclose that the filters disposed over the photosensors are polysilicon filters, an insulating material in contact with the surface of the substrate directly above the third (blue) photosensor, a first filter being connected to a ground terminal configured to drain charge from the first filter, and wherein first, second, and third photosensors

are entirely laterally adjacent to each other such that the photosensors are not overlapping each other in the vertical direction.

On the other hand, Descure discloses an imaging device (Fig. 2C) comprising of red, green, and blue photosensors (1R, 1G, and 1B) that are entirely laterally adjacent to each other such that the photosensors are not overlapping each other in the vertical direction and are disposed within a substrate (2) and include color filters placed over each of the respective photosensors (Fig. 1A, 1, Fig. 2C, 1R-1B) and the substrate, the photosensors formed at and extending within the substrate (2), that comprise a polysilicon layer (5) disposed over columns of silicon oxide (4) that vary in thickness for each color sensing region, the variation in thickness dictating which light wavelengths are allowed to reach the below photosensors, wherein the blue photosensor (1B) includes an insulating layer of silicon oxide (4-3) disposed directly above the photosensor and in contact with the surface of the substrate (as shown in Fig. 1A where the silicon oxide layer contacts the substrate 2) that acts as an insulating material (Abstract, Col. 1, 20-29, Col. 2, 19-46, Col. 3, 1-20, Col. 4, 5-9).

Additionally, Merrill 2 discloses a vertical color filter detector (Figs. 2A and Fig. 3) that detects red, green, and blue light incident upon the filter comprising of p-type semiconductor regions (32, 36, and 40) that act to isolate and provide filters for n-type photodiodes (34, 38, and 42) that absorb the light incident upon the photodiode layers of the vertical color detector in order to produce electric carriers representing an image signal formed by the incident light wherein each of the p-type filter regions disposed above the n-type photodiodes are connected

to a fixed ground potential, the connection of the p-type layers to the ground potential being a terminal that enables the p-type layers to act as reference layers where charges within the p-type layers are drained away (or set to the connected ground potential) (Page 1, 0014, Page 2, 0028, 0030-0032, Page 3, 0033).

It would have been obvious to one having ordinary skill in the art at the time of invention to connect filter elements to a ground terminal for placing the filter elements at a reference ground potential (draining charges from the filter layer) as taught by Merrill 2 and to place first, second, and third photosensors entirely laterally adjacent to one-another such that the photosensors do not overlap each other in a vertical direction and to use polysilicon layers as color filters disposed over the photosensors and include an insulating material in contact with the surface of a substrate directly above the blue photosensor as taught by Descure with the pixel array of Merrill because the prior art are directed towards color sensors with color filters disposed above the sensing regions and because all the claimed limitations are disclosed within the cited prior art and because placing the photosensors and corresponding filter components within Merrill entirely laterally adjacent to each other such that they do not overlap in a vertical direction would provide an alternative configuration and design choice for the layout of the photosensors and their corresponding filters whereby the functions and operations of the photosensors would remain unchanged by detecting light of various wavelengths dictated by the thickness of the color filters and connecting the filters to a ground terminal would prevent charge buildup

within the filter layers and interference between the photosensing elements of the array and because using layers of polysilicon as color filters would enable the pixels within Merrill to act as disclosed by absorbing incident wavelengths of light that aren't long enough to pass through the color filters having particular thicknesses as well as passing incident wavelengths of light long enough to penetrate through the color filters and reach the corresponding photosensors to capture the light wavelengths and because providing an insulating layer above the blue photosensing region at the top of the pixel would enable various other electrical connections to be made with the pixels.

10. As to claim 12, Merrill illustrates the first (78), second (68), and third (90) photosensors are formed beneath an upper surface (isolation regions 88 of substrate component 86) of the substrate (p-type layers 62, 64, 74, and 86).

11. As to claim 14, Merrill teaches that filter component (80) is formed to attenuate light of blue wavelengths while passing light of green and red wavelengths to sensing region (78) (Fig. 7, Col. 5, 37-46, Col. 6, 23-33).

12. As to claim 15, Merrill teaches that filter component (70) attenuates light with blue and green wavelengths, while passing light of red wavelengths to the sensing region (68) (Fig. 7, Col. 5, 37-46, Col. 6, 15-22).

13. As to claim 18, Descure teaches a silicon nitride layer (6) is formed over the polysilicon layer (5) providing insulation (Col. 2, 24-27).

14. As to claim 20, Merrill teaches the pixel array may be fabricated to an arbitrary size, which includes about 1.3 megapixels to about 4 megapixels (Col. 16, 34-39).

15. As to claim 21, Merrill teaches that the filter components surround the sensing regions vertically (70, 80, 96) and horizontally (66, 76, 88) create a sealed container around the sensing region, enabling the blocking of non-normally incident light. Merrill also teaches that a light shield (104) is included to only allow light through an aperture (106) to reach the sensing elements, thereby also blocking non-normally incident light (Col. 6, 51-55).

16. As to claim 30, Merrill teaches an imager integrated circuit (Fig. 15) to be used with an array of color-filter detectors (Fig. 17) and corresponding circuitry (270-282). The color-filter detectors (Fig. 7) within the array each comprise of a substrate comprising of p-type layers (62, 64, 74, and 86) and a silicon overlayer (62a), a first photosensor (green photosensor 78) disposed at or beneath the surface of the substrate, a first filter (80 and 86) of various p-type layers over the first photosensor and in contact with the substrate (doping region 76 of substrate component 74 and isolation regions 88 of substrate component 86), the first filter having a first thickness from being a part of a 1 micron p-type layer (74) and

including the thickness of a .25 micron p-type layer (86) and absorbing incident light with wavelengths shorter than those of green light and transmitting light at wavelengths greater or equal to green light onto the photosensor that receives the light passed through the first filter (as shown in Figure 7 where light rays with wavelengths characteristic of green and blue light pass through layers 86 and 80 to be absorbed at detector 78 while red light rays pass through detector 78), the first photosensor absorbing/holding the charges created by light having wavelengths equivalent to green light and passes on red light which has a longer wavelength, a second photosensor (red detector 68) at or beneath the surface of the substrate and laterally adjacent to the first photosensor (78), as illustrated in Figure 7 being placed offset laterally to the first photosensor (78), that has a second filter (70, 74, and 86) comprising of various p-type layers disposed over the second photosensor (68) and in contact with the substrate (doping region 66 of substrate component 64 and doping regions 76 of substrate component 74), the second filter being thicker than the first filter from being part of a thicker 2 micron p-type layer (64) and comprising of the 1 micron and .25 micron p-type layers (74 and 86) (Fig. 7), that absorbs light with wavelengths less than those of red light and allows red light to pass through to the second photosensor (red 68) that receives the light passed through the second filter and absorbs/holds the charges created by light having wavelengths equivalent to red light and passes on light with wavelengths longer than those of red light (as shown in Figure 7 where light rays with wavelengths characteristics of red light pass through layers 70, 74, and 86 to be absorbed by detector 68), and a third photosensor (blue

detector 90) at or beneath the surface of the substrate and laterally adjacent to the first and second photosensors (78 and 68), as shown in Figure 7 being placed offset to the first and second photosensors, that absorbs incident light (blue light) at wavelengths shorter than the first wavelength and passing a majority of incident light at wavelengths longer than the first wavelength (green light) (as shown in Figure 7 as the blue light ray stops at detector 90 and the red and green light rays pass through the detector 90) wherein the p-type layers (80) over the first photosensor (78) and the p-type layers (70) over the second photosensor (68) are above the surface of the substrate (the first filter (80 and 86) is disposed on top of the surface of substrate portion 74 which is also above substrate portions 64 and 62, and the second filter (70, 74, and 86) is disposed on top of the surface of substrate portion 64 which is also above the substrate portion 62) (Col. 5, 37-46, 62-67, Col. 6, 4-66, Col. 14, 45-67, Col. 16, 34-42).

The color filters (76, 80, 86) surrounding the first photosensor (78) absorb light shorter than the wavelength of green (less than 490nm) and transmit wavelengths of green or higher (greater than 490) to the first photosensor. The first photosensor absorbs a majority of green light (490-575nm) and transmits light with wavelengths longer than that of green (greater than 575nm). The second containers/filters (66, 70, 74, and 86) surrounding the second photosensor (68) absorb light at wavelengths shorter than green light (490-575nm) and transmit light with wavelengths longer than that of green (greater than 575nm) to the second photosensor (68). The second photosensor receives light passing through the filter sections and absorbs red light (575-700nm), which

has longer wavelengths than green light. Light with a wavelength greater than 700nm would be able to travel deeper within the detector as the longer wavelength implies the deeper the light will penetrate the body of the detector before it is absorbed, therefore light greater than 700nm would be transmitted through the second photosensor (68) (Col. 5, 19-25, 37-46, 62-67, Col. 6, 4-55).

It is however noted that Merrill fails to particularly disclose first, second, and third sets of pixels that are at a same depth below a substrate's surface, wherein the photodiode of each pixel is entirely laterally adjacent to photodiodes of other pixels such that the photodiode is not overlapping photodiodes of other pixels in a vertical direction, that the filters disposed over the photosensors are polysilicon filters in the first, second, and third sets of pixels, the filters being connected to a ground terminal configured to drain charge from the first filter, and an insulating material in contact with the surface of the substrate directly above the third sets of pixels.

On the other hand, Descure discloses an imaging device (Fig. 2C) comprising of red, green, and blue photodiodes (1R, 1G, and 1B) that are entirely laterally adjacent to each other such that the photodiodes are not overlapping each other in the vertical direction and are disposed within a substrate (2) and include color filters placed over each of the respective photodiodes (Fig. 1A, 1, Fig. 2C, 1R-1B) and the substrate, the photodiodes formed at and extending within the substrate (2), that comprise a polysilicon layer (5) disposed over columns of silicon oxide (4) that vary in thickness for each color sensing region, the variation in thickness dictating which light wavelengths are allowed to reach

the below photodiodes, wherein the blue photodiode (1B) includes an insulating layer of silicon oxide (4-3) disposed directly above the photodiode and in contact with the surface of the substrate (as shown in Fig. 1A where the silicon oxide layer contacts the substrate 2) that acts as an insulating material (Abstract, Col. 1, 20-29, Col. 2, 19-46, Col. 3, 1-20, Col. 4, 5-9).

Additionally, Merrill 2 discloses a vertical color filter detector (Figs. 2A and Fig. 3) that detects red, green, and blue light incident upon the filter comprising of p-type semiconductor regions (32, 36, and 40) that act to isolate and provide filters for n-type photodiodes (34, 38, and 42) that absorb the light incident upon the photodiode layers of the vertical color detector in order to produce electric carriers representing an image signal formed by the incident light wherein each of the p-type filter regions disposed above the n-type photodiodes are connected to a fixed ground potential, the connection of the p-type layers to the ground potential being a terminal that enables the p-type layers to act as reference layers where charges within the p-type layers are drained away (or set to the connected ground potential) (Page 1, 0014, Page 2, 0028, 0030-0032, Page 3, 0033).

It would have been obvious to one having ordinary skill in the art at the time of invention to connect filter elements to a ground terminal for placing the filter elements at a reference ground potential (draining charges from the filter layer) as taught by Merrill 2 and to place first, second, and third photodiodes within first, second and third sets of pixels entirely laterally adjacent to one-another such that the photodiodes do not overlap each other in a vertical

direction and to use polysilicon layers as color filters disposed over the photodiodes and include an insulating material in contact with the surface of a substrate directly above the sets of blue photodiodes as taught by Descure with the pixel array of Merrill because the prior art are directed towards color sensors with color filters disposed above the sensing regions and because all the claimed limitations are disclosed within the cited prior art and because placing the photosensors and corresponding filter components within Merrill entirely laterally adjacent to each other such that they do not overlap in a vertical direction would provide an alternative configuration and design choice for the layout of the photosensors and their corresponding filters whereby the functions and operations of the photosensors would remain unchanged by detecting light of various wavelengths dictated by the thickness of the color filters and connecting the filters to a ground terminal would prevent charge buildup within the filter layers and interference between the photosensing elements of the array and because using layers of polysilicon as color filters would enable the pixels within Merrill to act as disclosed by absorbing incident wavelengths of light that aren't long enough to pass through the color filters having particular thicknesses as well as passing incident wavelengths of light long enough to penetrate through the color filters and reach the corresponding photosensors to capture the light wavelengths and because providing an insulating layer above the blue photosensor at the top of the pixel would enable various other electrical connections to be made with the pixels.

17. As to claim 31, the Merrill, Descure, and Merrill 2 references disclose all claimed subject matter with regards the comments of claim 30.

Additionally, Descure also teaches that in the field of optical radiation, crystal silicon and polysilicon have similar refraction coefficients and the thickness of the layered materials can be adjusted to filter a specific wavelength of light; therefore the polysilicon layer (5) can be replaced with a layer of crystal silicon, used as the substance of the substrate (2), and used as a color filter for the incident light impinging upon the photosensing regions (Col. 2, 23-33).

18. As to claims 58, 59, and 60, the Merrill, Descure, and Merrill 2 references disclose all claimed subject matter with regards the comments of claims 11, 30, and 31.

19. As to claim 61, the Merrill, Descure, and Merrill 2 references disclose all claimed subject matter with regards the comments of claim 11.

20. As to claim 62, the Merrill, Descure, and Merrill 2 references disclose all claimed subject matter with regards the comments of claim 12.

21. As to claim 63, the Merrill, Descure, and Merrill 2 references disclose all claimed subject matter with regards the comments of claim 14.

22. As to claim 64, the Merrill, Descure, and Merrill 2 references disclose all claimed subject matter with regards the comments of claim 15.

23. As to claim 66, the Merrill, Descure, and Merrill 2 references disclose all claimed subject matter with regards the comments of claim 18.

24. As to claim 67, the Merrill, Descure, and Merrill 2 references disclose all claimed subject matter with regards the comments of claim 21.

25. ***Claims 13 and 19 are rejected under 35 U.S.C 103 as being unpatentable over Merrill (US Patent 7,132,724) [hereafter Merrill] in view of Descure (US Patent 6,960,799) [hereafter Descure] and Merrill (US PGPub 2002/0058353) [hereafter Merrill 2], as applied to claims 12 and 18 respectively, in view of Rhodes (US Patent 6,815,743) [hereafter Rhodes].***

26. As to claim 13, both Merrill and Descure teach the first, second, and third photosensors of the pixel array are photodiodes (Merrill, Col. 6, 39, Descure, Col. 2, 19-34).

It is however noted that Merrill, Descure, and Merrill 2 fail to teach selecting the photosensor from a group consisting of a photodiode, photogate, photoconductor, or other image to charge converting device for initial accumulation of photo-generated charge.

On the other hand, Rhodes teaches a CMOS color detector (Fig. 12) in which the photosensitive elements (24a-24c) for each pixel cell (100a-100c) is a photogate, but can also be a photodiode, a photoconductor, or other photosensitive elements to accumulate photogenerated charge (Col. 9, 54-61).

It would have been obvious to one having ordinary skill in the art at the time of invention to choose a photosensor from amongst a group consisting of a photodiode, photogate, photoconductor, or other image to charge converting device as taught by Rhodes with the pixel array of Merrill, modified with the teachings of Merrill 2 and Descure, because the prior art are directed towards imagers that capture incident light and convert captured light to electrical signals and because any of the listed photosensor types would allow the array of Merrill and Descure to function as described by enabling capture and conversion of incident light representing an image into photo-generated charges.

27. As to claim 19, Rhodes teaches an insulating cap layer (110a-110c) of silicon nitride where electrical contacts are formed (Col. 9, 54-67, Col. 10, 1-6).

28. ***Claims 16 and 65 are rejected under 35 U.S.C 103 as being unpatentable over Merrill (US Patent 7,132,724) [hereafter Merrill] in view of Descure (US Patent 6,960,799) [hereafter Descure] and Merrill (US PGPub 2002/0058353) [hereafter Merrill 2], as applied to claims 11 and 61, in view of Randazzo (US Patent 6,093,585) [hereafter Randazzo].***

29. As to claims 16 and 65, it is noted that Merrill, Descure, and Merrill 2 fail to teach a layer of tetraethyl orthosilicate is formed over the polysilicon layer.

On the other hand, Randazzo teaches a layer of dielectric material such as tetraethyl orthosilicate (TEOS) (Fig. 2C, 202) is formed over a layer of polysilicon (200) (Col. 1, 43-59).

It would have been obvious to one having ordinary skill in the art at the time of invention to including forming a layer of tetraethyl orthosilicate (TEOS) over a polysilicon layer as taught by Randazzo with the polysilicon filter within the pixel array of Merrill, modified with the teachings of Merrill 2 and Descure, because the prior art are directed towards solid-state semiconductor fabrications of electrical circuits and because the TEOS layer would provide a dielectric coating that can be used as a cap layer upon the layers of polysilicon within the pixels within the imaging device.

30. ***Claims 72 and 75-76 are rejected under 35 U.S.C 103 as being unpatentable over Merrill (US Patent 7,132,724) [hereafter Merrill] in view of Descure (US Patent 6,960,799) [hereafter Descure].***

31. As to claim 72, Merrill discloses an image pixel array (Fig. 17) comprising a first, second, and third pixel group each comprising a plurality of pixels (Fig. 7, the group of vertical color filter detectors within the array each comprise red, green, and blue pixels), each pixel having a single photosensor (red photosensor 68, green photosensor 78, and blue photosensor 90) and being arranged so that

the photosensors of the pixels are arrayed in rows and columns (as shown in Fig. 17), each photosensor in a pixel ground being arranged to receive light of a different wavelength from photosensors in another pixel group (the red pixels receiving light of 575-700nm, the green pixels receiving light of 490-575nm, and the blue pixels receiving light of less than 490nm), the pixels of the first pixel group (green) comprising a first photosensor (green photosensor 78) disposed at or beneath the surface of the substrate comprising of p-type layers (62, 64, 74, and 86), a first filter (80 and 86) of various p-type layers over the first photosensor and in contact with the substrate (doping region 76 of substrate component 74 and isolation regions 88 of substrate component 86), the first filter having a first thickness from being a part of a 1 micron p-type layer (74) and including the thickness of a .25 micron p-type layer (86) and absorbing incident light with wavelengths shorter than those of green light and transmitting light at wavelengths greater or equal to green light onto the photosensor that receives the light passed through the first filter (as shown in Figure 7 where light rays with wavelengths characteristic of green and blue light pass through layers 86 and 80 to be absorbed at detector 78 while red light rays pass through detector 78), the first photosensor absorbing/holding the charges created by light having wavelengths equivalent to green light and passes on red light which has a longer wavelength, the pixels of the second pixel group (red) comprising a second photosensor (red detector 68) at or beneath the surface of the substrate and laterally adjacent to the first photosensor (78), as illustrated in Figure 7 being placed offset laterally to the first photosensor (78), that has a second filter (70,

74, and 86) comprising of various p-type layers disposed over the second photosensor (68) and in contact with the substrate (doping region 66 of substrate component 64 and doping regions 76 of substrate component 74), the second filter being thicker than the first filter from being part of a thicker 2 micron p-type layer (64) and comprising of the 1 micron and .25 micron p-type layers (74 and 86) (Fig. 7), that absorbs light with wavelengths less than those of red light and allows red light to pass through to the second photosensor (red 68) that receives the light passed through the second filter and absorbs/holds the charges created by light having wavelengths equivalent to red light and passes on light with wavelengths longer than those of red light (as shown in Figure 7 where light rays with wavelengths characteristics of red light pass through layers 70, 74, and 86 to be absorbed by detector 68), and the pixels of the third pixel group (blue) comprising a third photosensor (blue detector 90) at or beneath the surface of the substrate and laterally adjacent to the first and second photosensors (78 and 68), as shown in Figure 7 being placed offset to the first and second photosensors, that absorbs incident light (blue light) at wavelengths shorter than the first wavelength and passing a majority of incident light at wavelengths longer than the first wavelength (green light) (as shown in Figure 7 as the blue light ray stops at detector 90 and the red and green light rays pass through the detector 90) wherein the p-type layers (80) over the first photosensor (78) and the p-type layers (70) over the second photosensor (68) are above the surface of the substrate (the first filter (80 and 86) is disposed on top of the surface of substrate portion 74 which is also above substrate portions 64 and 62, and the second filter

(70, 74, and 86) is disposed on top of the surface of substrate portion 64 which is also above the substrate portion 62) (Col. 5, 37-46, 62-67, Col. 6, 4-66, Col. 14, 45-67, Col. 16, 34-42).

The color filters (76, 80, 86) surrounding the first photosensor (78) absorb light shorter than the wavelength of green (less than 490nm) and transmit wavelengths of green or higher (greater than 490) to the first photosensor. The first photosensor absorbs a majority of green light (490-575nm) and transmits light with wavelengths longer than that of green (greater than 575nm). The second containers/filters (66, 70, 74, and 86) surrounding the second photosensor (68) absorb light at wavelengths shorter than green light (490-575nm) and transmit light with wavelengths longer than that of green (greater than 575nm) to the second photosensor (68). The second photosensor region receives light passing through the filter sections and absorbs red light (575-700nm), which has longer wavelengths than green light. Light with a wavelength greater than 700nm would be able to travel deeper within the detector as the longer wavelength implies the deeper the light will penetrate the body of the detector before it is absorbed, therefore light greater than 700nm would be transmitted through the second photosensor (68) (Col. 5, 19-25, 37-46, 62-67, Col. 6, 4-55).

It is however noted that Merrill fails to particularly disclose pixels arrayed such that no portion of the photosensor of one pixel overlaps a portion of a photosensor of another pixel in a vertical direction, filters having one or more

layers of polysilicon, and an insulating material in contact with the surface of the substrate directly above the third photosensor.

On the other hand, Descure discloses an imaging device (Fig. 2C) comprising of an array of red, green, and blue photodiode regions (1R, 1G, and 1B) that are entirely laterally adjacent to each other such that the photodiodes are not overlapping each other in the vertical direction and are disposed within a substrate (2) and include color filters placed over each of the respective photodiodes (Fig. 1A, 1, Fig. 2C, 1R-1B) and substrate, formed at and extending within the substrate (2), that comprise a polysilicon layer (5) disposed over columns of silicon oxide (4) that vary in thickness for each color sensing region, the variation in thickness allocating which light wavelengths are allowed to reach the photodiodes wherein the blue photodiode (1B) has an insulating layer of silicon oxide (4-3) disposed directly above the region and in contact with the surface of the substrate (as shown in Fig. 1A where the silicon oxide layer contacts the substrate 2) that acts as an insulating material (Col. 1, 20-29, Col. 2, 19-46, Col. 3, 1-20, Col. 4, 5-9).

It would have been obvious to one having ordinary skill in the art at the time of invention to place first, second, and third photodiodes within first, second and third sets of pixels entirely laterally adjacent to one-another such that the photodiodes do not overlap each other in a vertical direction and to use polysilicon layers as color filters disposed over the photodiodes and include an insulating material in contact with the surface of a substrate directly above the sets of blue photodiodes as taught by Descure with the pixel array of Merrill

because the prior art are directed towards color sensors with color filters disposed above the sensing regions and because all the claimed limitations are disclosed within the cited prior art and because placing the photosensors and corresponding filter components within Merrill entirely laterally adjacent to each other such that they do not overlap in a vertical direction would provide an alternative configuration and design choice for the layout of the photosensors and their corresponding filters whereby the functions and operations of the photosensors would remain unchanged by detecting light of various wavelengths dictated by the thickness of the color filters and because providing an insulating layer above the blue photosensor at the top of the pixel would enable various other electrical connections to be made with the pixels.

32. As to claim 75, the Merrill and Descure references disclose all claimed subject matter with regards the comments of claim 72.

33. As to claim 76, the Merrill and Descure references disclose all claimed subject matter with regards the comments of claim 72.

34. ***Claims 73-74 are rejected under 35 U.S.C 103 as being unpatentable over Merrill (US Patent 7,132,724) [hereafter Merrill] and Descure (US Patent 6,960,799) [hereafter Descure], as applied to claim 72, in further view of Merrill (US PGPub 2002/0058353) [hereafter Merrill 2].***

35. As to claim 73, it is noted that Merrill and Descure fail to particularly disclose a first filter is connected to a ground terminal configured to drain charge from the first filter.

On the other hand, Merrill 2 discloses a vertical color filter detector (Figs. 2A and Fig. 3) that detects red, green, and blue light incident upon the filter comprising of p-type semiconductor regions (32, 36, and 40) that act to isolate and provide filters for n-type photodiodes (34, 38, and 42) that absorb the light incident upon the photodiode layers of the vertical color detector in order to produce electric carriers representing an image signal formed by the incident light wherein each of the p-type filter regions disposed above the n-type photodiodes are connected to a fixed ground potential, the connection of the p-type layers to the ground potential being a terminal that enables the p-type layers to act as reference layers where charges within the p-type layers are drained away (or set to the connected ground potential) (Page 1, 0014, Page 2, 0028, 0030-0032, Page 3, 0033).

It would have been obvious to one having ordinary skill in the art at the time of invention to connect filter elements to a ground terminal for placing the filter elements at a reference ground potential (draining charges from the filter layer) as taught by Merrill 2 with the pixel array of Merrill, modified with the teachings of Descure, because the prior art are directed towards color sensors with color filters disposed above the sensing regions and because all the claimed limitations are disclosed within the cited prior art and because connecting the filters of the pixels groups to a ground terminal would provide the predictable

benefit of preventing charge buildup within the filter layers and interference between the photosensing elements of the array.

36. As to claim 74, the Merrill, Descure, and Merrill 2 references disclose all claimed subject matter with regards the comments of claim 73.

Conclusion

37. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Osinski whose telephone number is (571) 270-3949. The examiner can normally be reached on Monday to Thursday

9 a.m. to 6 p.m. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan can be reached on (571) 272-3022. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

MO

/MICHAEL OSINSKI/

Examiner, Art Unit 2622

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